

Appl. No. 10/068,928
Reply to Office Action of January 24, 2006

Attorney Docket No. 2001.1379/24061.421
Customer No. 42717

REMARKS

Claims 1-21 and 23 are present in the application. In view of the remarks that follow, Applicants respectfully request reconsideration of the application.

Independent Claim 1 - Sakaguchi and Henley

Independent Claim 1 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sakaguchi U.S. Patent No. 6,221,738 and Henley U.S. Patent No. 6,013,563. This ground of rejection is respectfully traversed. In this regard, the PTO recognizes in MPEP §2142 that:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that Sakaguchi and Henley fail to establish a *prima facie* case of obviousness under §103 with respect to Claim 1, for mutually exclusive reasons that are discussed below.

SAKAGUCHI DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

The limitations of independent Claim 1 include a recitation of:

providing a first wafer with a surface comprising of a first semiconductor layer of a first natural lattice constant;

forming a second semiconductor layer with a second natural lattice constant on the first semiconductor layer, said first and second natural lattice constants being different so as to

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introduce a strain gradient at the interface of said second semiconductor layer and said first semiconductor layer; . . . and
performing a water jet cleaving procedure at said strain gradient so that said second semiconductor layer is separated from said first semiconductor layer and said first wafer due to cleaving facilitated by said strain gradient.

The present Office Action relies on the embodiment shown in Figures 4A-4D of Sakaguchi, and asserts that two layers 102 and 103 thereof have different lattice constants that inherently produce a strain gradient, such that separation can be effected by introducing an external force at the strain gradient. However, this is the direct opposite of what Sakaguchi teaches. In particular, Sakaguchi teaches that, in Figures 4A-4D, cleaving is caused by the porosity of the layer 103, without regard to whether the lattice constants are the same or are different. More specifically, Sakaguchi specifically states in lines 15-18 of column 9 that:

. . . the separation layer can be formed without the use of heteroepitaxy [different lattice constants]. As an example, a porous material is used.

In other words, Sakaguchi expressly emphasizes that, in his invention, separation is effected through use of "a porous material", and "without the use of heteroepitaxy [different lattice constants]". The Office Action insists that the layers 102 and 103 in Sakaguchi do in fact have different lattice constants. But even assuming the Examiner is correct (or in other words that the layers 102 and 103 do have different lattice constants), this has absolutely no relevance to how Sakaguchi achieves cleaving. The §103 rejection is based on the embodiment shown in Figures 4A-4D of Sakaguchi and, in this embodiment, cleaving occurs due to porosity of the layer 103, and not due to a difference in lattice constants.

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In lines 8-14 on page 3, the Office Action asserts that, in lines 1-3 of column 14, Sakaguchi teaches the use of an external force at a strain gradient to cleave two portions of a device. However, this is not what is taught by the indicated portion of Sakaguchi. More specifically, the indicated portion of Sakaguchi states that:

... as shown in FIG. 4D, the bonded substrate members 101 and 106 are separated by the application of an external force or by the generation of an internal pressure, whereby the substrate members are mutually divided by the interface between the second porous layer 103 and the non-porous layer 102', which is different from the bonding interface. In this operation, a part of the second porous layer 103 in the vicinity of such a separating interface may be broken and lost. (Emphasis added)

In other words, the Office Action is relying on a portion of Sakaguchi that does not teach separation due to a strain caused by differing lattice constants. Instead, as already explained above, Sakaguchi teaches the provision of a layer of porous material, and the application of a force to the porous layer in order to effect a separation, where the porous layer may actually be destroyed as the separation occurs. As discussed above, Sakaguchi emphasizes that his invention achieves separation through the use of "a porous material", and "without the use of heteroepitaxy".

Thus, the indicated portions of Sakaguchi do not teach what the Office Action says they do. In particular, they very clearly teach that cleaving occurs due to the presence of a layer with a high porosity, and not due to the use of heteroepitaxy (i.e. differing lattice constants). Accordingly, it is respectfully submitted that Sakaguchi fails to fulfill its intended role in the §103 rejection, and that the §103 rejection is therefore defective. For this independent reason

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alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by the proposed combination of Sakaguchi and Henley.

PTO CANNOT ESTABLISH OBVIOUSNESS WITH ART THAT TEACHES AWAY

In evaluating obviousness, it is not proper to selectively consider only part of a reference, while ignoring other parts that teach away from the invention. In this regard, the provisions of MPEP §2141.02 specify that:

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (Emphasis in original).

In the present situation, and as noted above, the Office Action relies on the embodiment in Figures 4A-4D of Sakaguchi, and asserts that two layers 102 and 103 thereof have different lattice constants that inherently produce a strain gradient, such that separation can be effected by introducing an external force at the strain gradient. However, as explained above, Sakaguchi actually teaches a significantly different approach, where a layer made of a porous material is provided, and a force is applied to the porous layer in order to effect a separation. Sakaguchi emphasizes that this "porosity" approach is superior to an approach that uses differing lattice constants. For example, Sakaguchi states at lines 55-61 of column 11 that use of a porous layer without differing lattice constants is better because it:

... allows the transfer of an Si layer of excellent crystallinity or a non-porous single-crystal compound semiconductor layer onto the insulating surface of an economically excellent substrate having a large area, while sufficiently suppressing cracks resulting from a

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difference in lattice constant or in thermal expansion coefficient,
which is a problem encountered by conventional methods . . .

Sakaguchi also emphasizes, in lines 15-18 of column 9, that

. . . the separation layer can be formed without the use of
heteroepitaxy. As an example, a porous material is used.

Thus, Sakaguchi criticizes the idea of using differing lattice constants, while promoting a different approach that involves the use of a porous material. Sakaguchi thus teaches directly away from the use of lattice constants, in favor of the alternative approach of using a layer of porous material. The §103 rejection also relies on the Henley patent, but does not assert that Henley has any relevant teachings in regard to lattice constants. (In fact, it does not appear that Henley even mentions "lattice constants"). Consequently, Sakaguchi teaches directly away from Applicants' invention, and Henley adds nothing at all on this particular point.

Since it is well recognized that teaching away from a claimed invention is a per se demonstration of lack of prima facie obviousness, it is respectfully submitted that Sakaguchi and Henley do not factually support a prima facie case of obviousness with respect to Claim 1. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Sakaguchi and Henley.

In view of the various different reasons discussed above, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by Sakaguchi and Henley. Claim 1 is thus believed to be allowable over Sakaguchi and Henley, and notice to that effect is respectfully requested.

Independent Claim 1 - Godbey and Henley

Independent Claim 1 further stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Godbey U.S. Patent No. 5,013,681 and the Henley

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patent. This ground of rejection is respectfully traversed. In this regard, and as mentioned earlier, the PTO recognizes in MPEP §2142 that:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that the teachings drawn from Godbey and Henley fail to establish a *prima facie* case of obviousness under §103 with respect to Claim 1, for mutually exclusive reasons that are discussed below.

GODBey DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

With reference to the last paragraph on page 4 in the Office Action, the Examiner asserts that Figures 9-12 of Godbey disclose two layers 72 and 74 with different lattice constants that inherently produce a strain gradient, such that cleaving can be effected by introducing an external force at the strain gradient. However, Godbey does not appear to even remotely suggest that an external force could be used to cleave two different portions of a device, much less that cleaving could occur due to a strain gradient between adjacent layers that have differing lattice constants. Instead, Godbey's teachings are significantly different. In particular, Godbey teaches that excess material is removed from his device not by cleaving, but by etching and/or grinding/polishing. For example, lines 30-35 in column 4 state that the layer 20 in the embodiment of Figures 1-6 is removed by grinding, chemical polishing, and/or etching. And lines 46-50 in column 5 state that the process steps for the embodiment of Figures 9-12 are the same as for the embodiment of Figures 1-6. Thus, since the indicated portion of Godbey does not teach what the Office Action says it does, it is respectfully submitted that Godbey fails to fulfill its intended role in the §103 rejection, and that the §103 rejection is therefore defective.

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For this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by the proposed combination of Godbey and Henley.

THE PRIOR ART MUST TEACH ALL CLAIM LIMITATIONS UNDER §103

The provisions of MPEP §2142 state that that:

To establish a *prima facie* case of obviousness, . . . the prior art reference (or references when combined) must teach or suggest all the claim limitations.

As discussed above, neither Godbey nor Henley appears to disclose certain limitations that are expressly recited in Claim 1, including the limitations of Claim 1 that have been quoted above. Therefore, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Godbey and Henley, because Godbey and Henley do not together "teach or suggest all the claim limitations" (emphasis added), as required by MPEP §2142. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Godbey and Henley.

In view of the various different reasons discussed above, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by Godbey and Henley. Claim 1 is thus believed to be allowable over Godbey and Henley, and notice to that effect is respectfully requested.

Independent Claim 11

Independent Claim 11 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sharma U.S. Patent No. 5,344,524 and the Henley patent. This ground of rejection is respectfully traversed. In this regard, the PTO recognizes in MPEP §2142 that:

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The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that the teachings drawn from Sharma and Henley fail to establish a *prima facie* case of obviousness under §103 with respect to Claim 11, for mutually exclusive reasons that are discussed below.

SHARMA DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

The limitations of Claim 11 include a recitation of:

providing a first wafer with a surface comprising of a first semiconductor material of a first natural lattice constant;

forming a second semiconductor layer with a second natural lattice constant on the first semiconductor material so that said second semiconductor layer is strained, said first and second natural lattice constants being different so that a large strain gradient is formed at the interface of said second semiconductor layer and said first semiconductor material; . . .

performing a compressed air or pressurized fluid cleaving procedure at said strain gradient so that said second semiconductor layer is separated from said first semiconductor material due to cleaving facilitated by said strain gradient, resulting in a fourth wafer comprised of said second semiconductor layer and said second wafer; . . .

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In the paragraph that bridges pages 6-7, the Office Action asserts that Figure 5 of Sharma discloses two layers 21 and 23 with different lattice constants that inherently produce a strain gradient, such that cleaving is effected by introducing an external force at the strain gradient. However, this is not what Sharma teaches. More specifically, Sharma does not appear to even remotely suggest that an external force is used to cleave two different portions of a device, much less through the provision of adjacent layers that have different lattice constants. Instead, Figure 5 makes it very clear that excess material is removed from the device not by cleaving, but instead by etching and/or grinding/polishing. (For example, see the label "Grinding/Selective Etching" in Figure 5). Thus, Sharma does not actually teach what the Office Action says it does. As a result, the §103 rejection of Claim 11 is inherently defective. For this independent reason alone, it is respectfully submitted that Claim 11 is not rendered obvious under §103 by the proposed combination of Sharma and Henley.

THE PRIOR ART MUST TEACH ALL CLAIM LIMITATIONS UNDER §103

The provisions of MPEP §2142 state that that:

To establish a *prima facie* case of obviousness, . . . the prior art reference (or references when combined) must teach or suggest all the claim limitations.

As discussed above, neither Sharma nor Henley appears to disclose certain limitations that are expressly recited in Claim 11, including the limitations from Claim 11 that have been quoted above. Accordingly, the §103 rejection fails to establish obviousness because, even when the indicated teachings are combined, they fail to satisfy the requirement of MPEP §2142 that they must collectively "teach or suggest all the claim limitations". For this independent reason alone, Claim 11 is believed to be patentably distinct from Sharma and Henley, and notice to that effect is respectfully requested.

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In view of the various different reasons discussed above, it is respectfully submitted that Claim 11 is not rendered obvious under §103 by Sharma and Henley. Claim 11 is thus believed to be allowable over Sharma and Henley, and notice to that effect is respectfully requested.

Independent Claim 20

The limitations of independent Claim 20 include a recitation of:

providing a first wafer having a first semiconductor layer
with a first natural lattice constant;

forming a second semiconductor layer with a second
natural lattice constant on the first semiconductor layer, said first
and second natural lattice constants being different so as to form an
interface with a large strain gradient; . . .

directing a pressurized fluid jet at said strain gradient so
that said second semiconductor layer is separated from said first
semiconductor layer and said first wafer due to cleaving facilitated
by said strain gradient.

Independent Claim 20 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sharma and Henley. This ground of rejection is respectfully traversed. The rationale provided in the Office Action for the rejection of Claim 20 is the same rationale provided for the rejection of Claim 11. Therefore, for reasons similar to those discussed above in association with Claim 11, it is respectfully submitted that Claim 20 is not rendered obvious under §103 by Sharma and Henley. Claim 20 is thus believed to be allowable over Sharma and Henley, and notice to that effect is respectfully requested.

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Dependent Claims

Claims 2-10, Claims 12-19 and Claims 21 and 23 respectively depend from Claim 1, Claim 11 and Claim 20, and are also believed to be distinct from the art of record, for example for the same reasons discussed above with respect to Claims 1, 11 and 20, respectively.

Conclusion

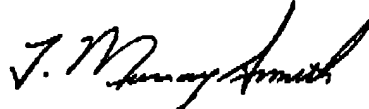
Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at 972-739-8647.

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Although Applicants believe that no fee is due in association with the filing of this Response, the Commissioner is hereby authorized to charge any additional fee required by this paper, or to credit any overpayment, to Deposit Account No. 08-1394 of Haynes and Boone LLP.

Respectfully submitted,



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Enclosures: None

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